



### **VFL Testing of Detector Voltage as it Relates to Interference Detection: Update March 20, 2013**

The DataMaster DMT is an infrared breath testing device designed to identify and quantify ethanol on the breath of individuals. It works on the basis of infrared absorption at specific wavelengths unique to ethanol. The DMT employs a Lead Selenide IR detector which is a photoconductive device that has sensitivity to IR in approximately the 2 to 5 micron range. The detector produces an output current proportional to the amount of IR energy incident on its surface. There are three filters within the DMT which filter the IR energy into specific and narrow regions. Those filters are centered at 3.44, 3.37 and 3.50 microns. These wavelengths allow for characterization of the absorption peak of ethanol in the 3.4 micron range where it has strong absorption of IR energy. The ratios between these three filters are unique to ethanol.

The detector voltage of the DMT is the DC output voltage of the detector processing circuitry. The voltage is typically viewed with the 3.44 micron filter (filter 1) in the optical path. When switching between the three filters, the detector voltage usually changes, though it is possible that there may be no difference in the reported voltages. The differences, if seen, are not due to the different wavelengths of the filters, but rather are due to the different characteristics of each filter's peak transmittance, half peak bandwidth and other variations of the transmittance characteristics of the individual filters.

The DC output voltage level of the detector ("detector voltage") is dependent on a number of conditions including detector sensitivity, IR source intensity, bias voltage level applied to the lead selenide, temperature of the detector as determined by the thermoelectric cooler, efficiency of the optical path through which the IR energy is transmitted (sample chamber), the peak transmittance and bandwidth of the IR filters and gain and offsets of the electronics processing the detector output current.

During instrument setup, a technician will adjust the parameters of the bias voltage level, TEC cooler level and IR source intensity per manufacturer's specifications such that the output DC voltage of the detector circuit is near zero volts when the 3.44 micron filter is in the optical path. Changes in the system components over time may cause the detector voltage to change from its original set value. Because of this, a zero baseline is established for each of the three wavelengths during the ambient zeroing process as part of every test sequence. A zero baseline is established for each of the three wavelengths as the voltage produced when each of the filters is inserted into the optical path is unique, as stated above. The DMT will zero the voltage so long as it is no more than approximately 1.500 volts, positive or negative, away from zero. If the voltage is within the allowable range for zeroing, the

process will go forward. If the voltage starting point is too far away from zero, the DMT will halt the test and produce an error message indicating that a filter will not zero.

The particular voltage level of the detector output has no bearing on the DMT's design or ability to identify interfering compounds in a breath or simulator sample. Interference detection is based on the ratio of absorption among the three filters. During calibration, a solution containing a known ethanol concentration (Ca) is analyzed by the instrument and normalized by dividing the known value (Ca) by the analyzed value resulting in the CAL. Furthermore, ratio calculations are determined based on the absorbance of ethanol at each of the three filters. These determinations, unique to ethanol, are compared to all subsequent analyses and must meet the criteria programmed in the DMT to qualify the sample as free of interfering substances. The starting detector voltages are not relevant so long as they are able to be zeroed at each of the three wavelengths, just as it had been during the calibration process.

During the predeployment testing of the DMT instruments in 2006-2009, there were observations made of certain instruments not performing well during interference testing. It was also noted that on some of these instruments, the detector voltage had drifted to levels above 300mV. An incorrect correlation was assumed that this higher detector voltage was the cause of the poor interference detection of the instruments. This phenomenon of high voltage and poor performance has proven to be coincidental, not causational. It was noted that on many of these instruments, the detector was replaced due to short term instability problems. A detector that is unstable in the short term would change detector voltage by 30mV or more over the time between the ambient zeroing and subsequent analysis. This would cause errors such as interference being detected when no interfering compounds were present, failing to detect an interfering compound that was present, filter won't zero error, calibration check errors and more. There is also documentation from this predeployment testing that shows instruments with high detector voltages successfully identified interfering compounds.

DataMaster DMT 104509 was tested on 9/19/2011 against a solution of 0.01% vol/vol Acetone in 0.08 g/210L Ethanol. The detector voltage prior to the interference analysis was 0.029V at filter 1, 0.620V at filter 2 and 0.192V at filter 3 (see page 5). This instrument identified the interfering substance 10 out of 10 times (see page 6). Instrument 104509 was subsequently deployed to Ludlow Police Department. As observed on Routine Performance Check reports, the detector voltage steadily drifted to ~0.600V. The unit was removed from the field on 6/27/2012. On 6/28/12 the detector voltage was checked by performing a diagnostic test. This test indicated that the voltage for filter 1 was 0.711V, 1.233V for filter 2 and 0.823V for filter 3 (see page 7). The instrument was tested against a solution of 0.01% vol/vol Acetone in 0.08 g/210L Ethanol. The instrument was able to ambient zero prior to each sampling indicating that none of the three filter readings were beyond the limitations of the instrument. The unit again reported interference detected 10 out of 10 times (see page 8). Subsequent to the interference test, another diagnostic test was completed to show that the voltages had not changed significantly (see page 9). In reviewing the filter results for both interference tests, the filter 2 readings (the wavelength at which acetone has a stronger absorption) were not significantly different.

DataMaster DMT 100161 was tested on 8/22/2011 against a solution of 0.01% vol/vol Acetone in 0.08 g/210L Ethanol. The detector voltage prior to the interferent analysis was 0.004V at filter 1, 0.314V at filter 2 and 0.506V at filter 3 (see page 10). The instrument was able to ambient zero prior to each sampling indicating that none of the three filter readings were beyond the limitations of the instrument. The instrument reported interference detected 10 out of 10 times (see page 11). At the end of January 2013, it was decided that this instrument would be removed from the field to investigate the effect of detector voltage in the negative direction on the ability to detect interfering compounds. A diagnostic test was performed at the agency on 1/31/2013 prior to the unit being removed from service. The voltages at that time were -0.302V for filter 1, 0.034V for filter 2, and 0.235V at filter 3 (see page 12). A second diagnostic test was performed at VFL on 2/4/2013 which showed similar voltages (see page 13). The instrument was then tested using a 0.01% vol/vol Acetone in 0.079 g/210L Ethanol solution. The first attempt was inadvertently performed using a bad lot of solution (see page 14). The second attempt using lot #12-85-08A1 showed that on an accuracy and precision test, the instrument appropriately reported interference detected 10 out of 10 times (see page 15). Another diagnostic test was run subsequent to the interferent analysis to demonstrate that the voltages had not been changed (see page 16).

These two units exemplify the characteristics of the instrument: detector voltage drift over the long term has no impact on an instrument's ability to detect interfering compounds.

Another concern that has been voiced is whether or not an instrument can properly identify an interfering compound when the instrument is intermittently reporting "interference" while testing interferent-free solutions. Occasionally there may be a problem or malfunction with an instrument such that the filter results are not what are expected for ethanol and "interference" is reported when in fact the sample is known to only contain ethanol. There are numerous conditions within the instrument that can cause this occurrence, however the software in the unit is designed as a fail-safe. If the filter readings are not what are expected for ethanol, then the instrument will report "interference". This is an example of the instrument working properly, as it will only report quantified ethanol results when all quality control checks (including filter ratios) are passing.

During the months of November and December of 2012, DataMaster DMT 104709 was being used as a training instrument at VFL. During accuracy and precision tests using 0.1 Ethanol simulator solution, the instrument occasionally reported "interference" on some of the replicates. Upon inspection of the filter readings, the reports document that the detector reading at filter 3 was occasionally beyond the acceptable limits for an ethanol-free sample, thus causing the error.

The instrument was recalibrated on 12/18/2012; however the error reoccurred on the subsequent calibration check test. Using this instrument with a known problem, three solutions containing interfering compounds were analyzed. An accuracy and precision check was performed using a 0.01% vol/vol Acetone in 0.08g/210L Ethanol solution (Lot #12-81-081A1), a 0.04% vol/vol Methanol in 0.08g/210L Ethanol solution (Lot #12-63-080M), and a 0.04% vol/vol Isopropanol in 0.08g/210L Ethanol solution (Lot #12-63-080I). All records are included for testing on this instrument; see pages 17-25. The instrument appropriately identified the solutions as containing an interferent 100% of the time.

Having an error with the instrument whereby “interference” is reported on an interferent-free sample does not indicate that the instrument fails to comply with interference detection standards required by Rule for the use of the DataMaster in evidential breath testing. When the DMT reports “interference”, it is not saying that it definitively identified an interfering compound. What it is saying is that it did not see the appropriate ratios to be able to report an ethanol result. The reporting of “interference” when it is known that there is not an interferent present could indicate that there may be something amiss with the unit which may require repair. However, if the problem is manifesting in a way which would potentially affect the ethanol result, an error will be identified and appropriately reported. Therefore, if an interferent is present on a sample, the unit will still appropriately report “interference”. The DataMaster DMT is designed as a fail-safe; in order to proceed with a test and report an ethanol result, the instrument must meet all internal and external quality control checks.



## DIAGNOSTIC RESULT

DataMaster DMT:104509  
Location:  
Calibration Date:  
Certification Date:  
Installation Date:  
Test Date: 09/19/2011  
Test Time: 09:24:51



VERSIONS  
DMT: 1.00  
PIC: 2.05  
Modem: 2.1  
Questions: 2.0

### TEMPERATURES

Sample Chamber = 49.2°C  
Breath Tube = 46.6°C  
Digital Sim = 33.5°C

### SETTINGS

Lamp Voltage = 1.66 V  
Cooler Voltage = 1.67 V  
Bias Voltage = 80 V  
Chopper Freq = 533 Hz

### PUMP INFO

Flow Rate = 6.097 L/M

### DETECTOR INFO

PUMP	ON	OFF
MAX(V)	0.0280	0.0307
MIN(V)	0.0266	0.0291

### FILTER INFO

Filter 1	0.029	Zero = true
Filter 2	0.620	Zero = true
Filter 3	0.192	Zero = true

### CALIBRATION CHECK

Xq = 0.088 0.39%



# ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMater DMT: 104509

Date: 09/19/2011

Time: 10:40:50

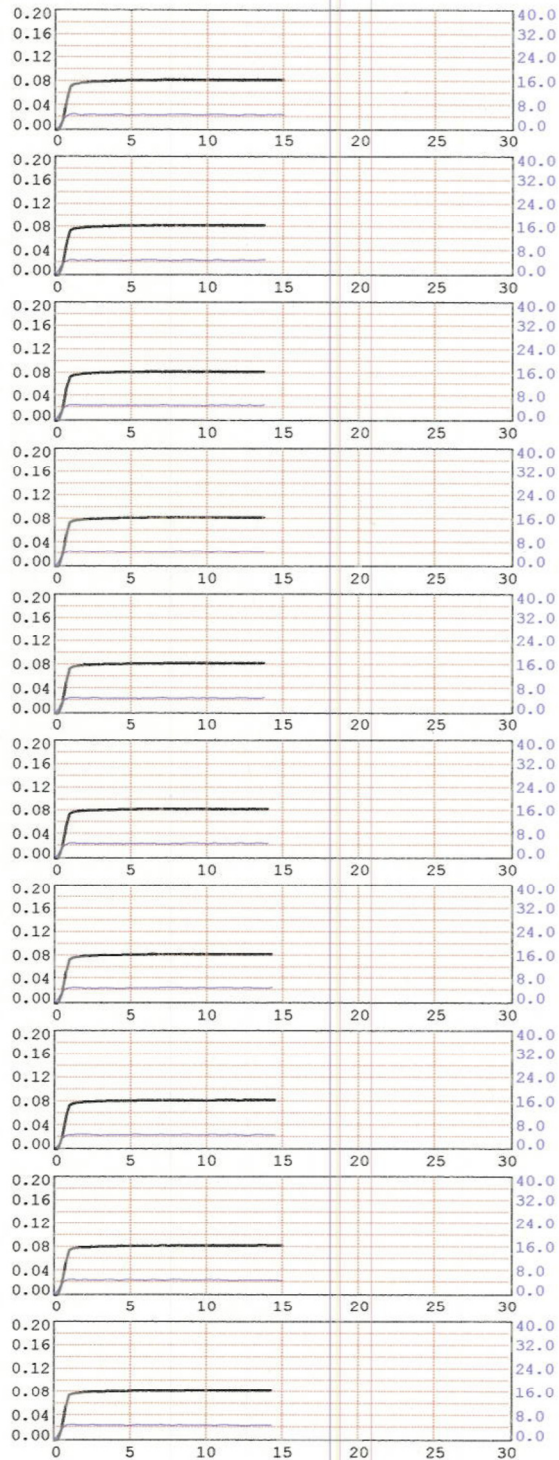
SUPERVISOR NAME:

KIRK L KIMBALL

SOLUTION LOT #: 12-09-080A1

SOLUTION CONCENTRATION: 0.080

BLANK TEST	0.000	10:41
CALIBRATION CHECK	PASSED	10:41
Xq = 0.088 (0.39%)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:42
X[1] = 0.0843 (-0.0069) (0.0011)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:43
X[1] = 0.0840 (-0.0070) (0.0008)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:44
X[1] = 0.0839 (-0.0071) (0.0008)		
SIMULATOR VAPOR 33.8°CINTERFERENCE		10:45
X[1] = 0.0840 (-0.0067) (0.0007)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:46
X[1] = 0.0841 (-0.0066) (0.0005)		
SIMULATOR VAPOR 33.8°CINTERFERENCE		10:47
X[1] = 0.0843 (-0.0062) (0.0008)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:48
X[1] = 0.0839 (-0.0070) (0.0006)		
SIMULATOR VAPOR 33.8°CINTERFERENCE		10:49
X[1] = 0.0835 (-0.0080) (0.0004)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:50
X[1] = 0.0843 (-0.0068) (0.0007)		
SIMULATOR VAPOR 33.7°CINTERFERENCE		10:52
X[1] = 0.0839 (-0.0070) (0.0007)		
BLANK TEST	0.000	10:52



DMT Serial Number #104509

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06/28/2012 1:25 PM

## DIAGNOSTIC RESULT

DataMaster DMT:104509  
Location: Ludlow PD  
Calibration Date: 09/19/2011  
Certification Date:09/19/2011  
Installation Date: 09/28/2011  
Test Date: 06/28/2012  
Test Time: 13:01:38



VERSIONS  
DMT: 1.01  
PIC: 2.05  
Modem: 2.2  
Questions: 2.0

### TEMPERATURES

Sample Chamber = 48.7°C  
Breath Tube = 45.6°C  
Digital Sim = 0.0°C

### SETTINGS

Lamp Voltage = 1.66 V  
Cooler Voltage = 1.67 V  
Bias Voltage = 80 V  
Chopper Freq = 526 Hz

### PUMP INFO

Flow Rate = 5.795 L/M

### DETECTOR INFO

PUMP	ON	OFF
MAX(V)	0.7092	0.7128
MIN(V)	0.7071	0.7110

### FILTER INFO

Filter 1	0.711	Zero = true
Filter 2	1.233	Zero = true
Filter 3	0.823	Zero = true

### CALIBRATION CHECK

Xq = 0.087 2.06%





ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMeter DMT: 104509  
Location: Ludlow PD

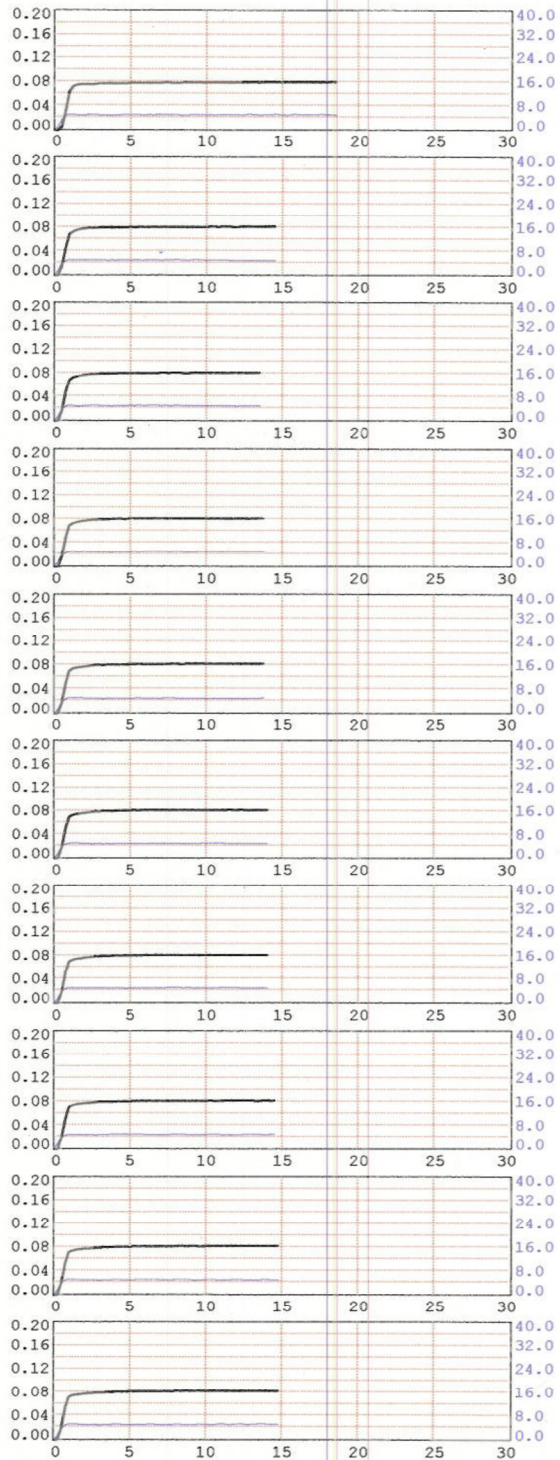
Date: 06/28/2012  
Time: 13:10:20

SUPERVISOR NAME:  
ALB ACETONE IN ETOH

SOLUTION LOT #: 12-79-08A1  
SOLUTION CONCENTRATION: 0.079

BLANK TEST	0.000	13:11
CALIBRATION CHECK	PASSED	13:11
Xq = 0.087 (1.67%)		
SIMULATOR VAPOR 34.1°CINTERFERENCE		13:11
X[1] = 0.0814 (-0.0060) (-0.0002)		
SIMULATOR VAPOR 34.0°CINTERFERENCE		13:12
X[1] = 0.0826 (-0.0058) (-0.0004)		
SIMULATOR VAPOR 34.0°CINTERFERENCE		13:13
X[1] = 0.0826 (-0.0061) (-0.0006)		
SIMULATOR VAPOR 34.0°CINTERFERENCE		13:15
X[1] = 0.0829 (-0.0060) (-0.0004)		
SIMULATOR VAPOR 34.1°CINTERFERENCE		13:16
X[1] = 0.0832 (-0.0065) (-0.0002)		
SIMULATOR VAPOR 34.1°CINTERFERENCE		13:17
X[1] = 0.0829 (-0.0066) (-0.0004)		
SIMULATOR VAPOR 34.0°CINTERFERENCE		13:18
X[1] = 0.0829 (-0.0065) (-0.0001)		
SIMULATOR VAPOR 34.0°CINTERFERENCE		13:19
X[1] = 0.0829 (-0.0063) (-0.0005)		
SIMULATOR VAPOR 34.1°CINTERFERENCE		13:20
X[1] = 0.0830 (-0.0064) (-0.0002)		
SIMULATOR VAPOR 34.0°CINTERFERENCE		13:21
X[1] = 0.0831 (-0.0061) (0.0001)		
BLANK TEST	0.000	13:22

Temp 34.0  
Thermocouple # 101489856  
(A)



## DIAGNOSTIC RESULT

DataMaster DMT:104509  
Location: Ludlow PD  
Calibration Date: 09/19/2011  
Certification Date:09/19/2011  
Installation Date: 09/28/2011  
Test Date: 06/28/2012  
Test Time: 13:25:33



VERSIONS  
DMT: 1.01  
PIC: 2.05  
Modem: 2.2  
Questions: 2.0

### TEMPERATURES

Sample Chamber = 49.2°C  
Breath Tube = 46.2°C  
Digital Sim = 34.0°C

### SETTINGS

Lamp Voltage = 1.66 V  
Cooler Voltage = 1.67 V  
Bias Voltage = 80 V  
Chopper Freq = 530 Hz

### PUMP INFO

Flow Rate = 5.998 L/M

### DETECTOR INFO

	PUMP	ON	OFF
MAX(V)	0.6774	0.6799	
MIN(V)	0.6758	0.6781	

### FILTER INFO

Filter 1	0.679	Zero = true
Filter 2	1.200	Zero = true
Filter 3	0.809	Zero = true

### CALIBRATION CHECK

Xq = 0.087 1.57%

## DIAGNOSTIC RESULT

DataMaster DMT:100161  
Location:  
Calibration Date: 08/22/2011  
Certification Date:  
Installation Date:  
Test Date: 08/22/2011  
Test Time: 07:49:42



### VERSIONS

DMT: 1.00  
PIC: 2.05  
Modem: 2.1  
Questions: 2.0

### TEMPERATURES

Sample Chamber = 49.2°C  
Breath Tube = 47.8°C  
Digital Sim = 34.2°C

### SETTINGS

Lamp Voltage = 1.79 V  
Cooler Voltage = 1.77 V  
Bias Voltage = 80 V  
Chopper Freq = 533 Hz

### PUMP INFO

Flow Rate = 5.485 L/M

### DETECTOR INFO

PUMP	ON	OFF
MAX(V)	0.0030	0.0049
MIN(V)	0.0006	0.0035

### FILTER INFO

Filter 1	0.004	Zero = true
Filter 2	0.314	Zero = true
Filter 3	0.506	Zero = true

### CALIBRATION CHECK

Xq = 0.086 0.00%





ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMater DMT: 100161

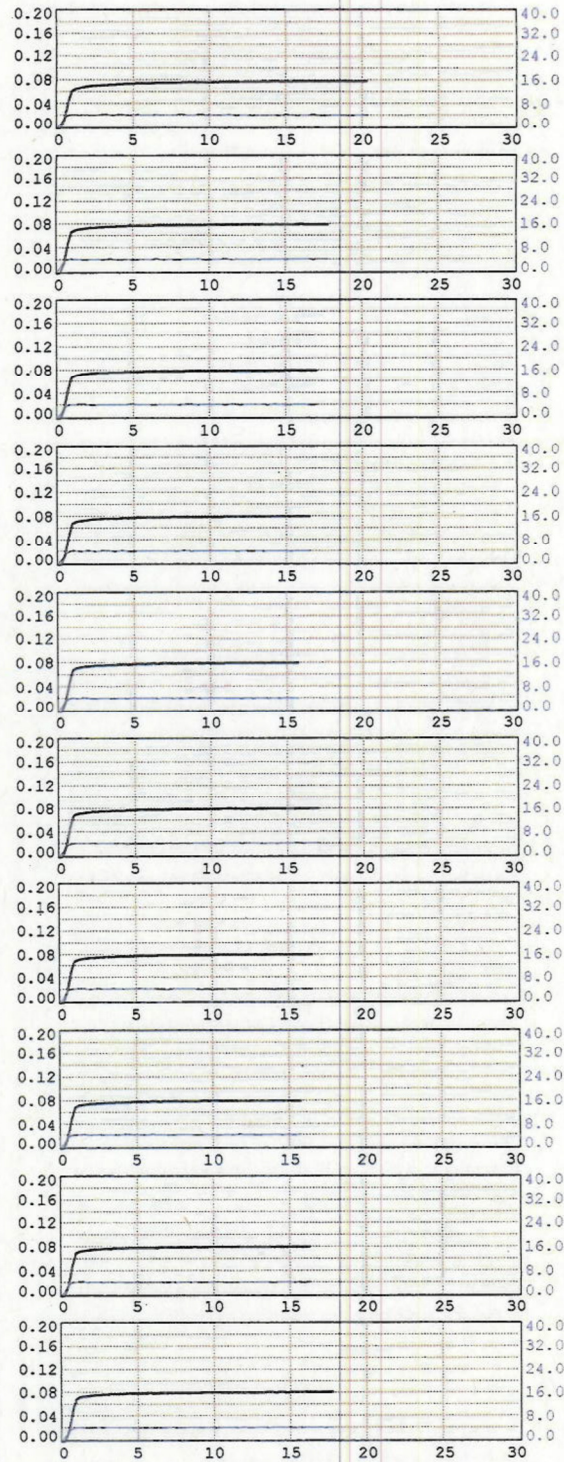
Date: 08/22/2011  
Time: 11:08:37

SUPERVISOR NAME:  
KIRK L KIMBALL

SOLUTION LOT #: 12-09-080A1  
SOLUTION CONCENTRATION: 0.080

BLANK TEST	0.000	11:09
CALIBRATION CHECK	PASSED	11:09
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:10
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:11
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:12
SIMULATOR VAPOR 34.0°C INTERFERENCE		11:13
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:14
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:15
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:16
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:18
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:19
SIMULATOR VAPOR 34.1°C INTERFERENCE		11:20
BLANK TEST	0.000	11:21

*0.010 Acetone  
0.080 EtOH  
100%  
Kek  
8-22-11  
JK*



DMT Serial Number #100161

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08/22/2011 11:22 AM

## DIAGNOSTIC RESULT

DataMaster DMT: 100161  
Location: Brattleboro VSP  
Calibration Date: 08/22/2011  
Certification Date: 08/22/2011  
Installation Date: 09/02/2011  
Test Date: 01/31/2013  
Test Time: 12:35:12



VERSIONS  
DMT: 1.01  
PIC: 2.05  
Modem: 2.4  
Questions: 2.1

### TEMPERATURES

Sample Chamber = 49.2°C  
Breath Tube = 47.6°C  
Digital Sim = 34.0°C

### SETTINGS

Lamp Voltage = 1.79 V  
Cooler Voltage = 1.77 V  
Bias Voltage = 80 V  
Chopper Freq = 539 Hz

### PUMP INFO

Flow Rate = 5.449 L/M

### DETECTOR INFO

	PUMP	ON	OFF
MAX(V)	-0.3026	-0.3000	
MIN(V)	-0.3043	-0.3012	

### FILTER INFO

Filter 1	-0.302	Zero = true
Filter 2	0.034	Zero = true
Filter 3	0.235	Zero = true

### CALIBRATION CHECK

Xq = 0.086 0.10%

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DMT Serial Number #100161

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01/31/2013 12:36 PM



## DIAGNOSTIC RESULT

DataMaster DMT:100161  
Location: Brattleboro VSP  
Calibration Date: 08/22/2011  
Certification Date: 08/22/2011  
Installation Date: 09/02/2011  
Test Date: 02/04/2013  
Test Time: 08:45:57



VERSIONS  
DMT: 1.01  
PIC: 2.05  
Modem: 2.4  
Questions: 2.1

### TEMPERATURES

Sample Chamber = 48.7°C  
Breath Tube = 46.7°C  
Digital Sim = 33.9°C

### SETTINGS

Lamp Voltage = 1.79 V  
Cooler Voltage = 1.77 V  
Bias Voltage = 80 V  
Chopper Freq = 531 Hz

### PUMP INFO

Flow Rate = 5.578 L/M

### DETECTOR INFO

PUMP	ON	OFF
MAX (V)	-0.2449	-0.2413
MIN (V)	-0.2463	-0.2427

### FILTER INFO

Filter 1	-0.242	Zero = true
Filter 2	0.088	Zero = true
Filter 3	0.277	Zero = true

### CALIBRATION CHECK

Pass = 0.0000 0.0000 0.0000

DMT Serial Number #100161

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02/04/2013 8:47 AM



ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMeter DMT: 100161  
Location: Brattleboro VSP  
Date: 02/04/2013  
Time: 09:36:31

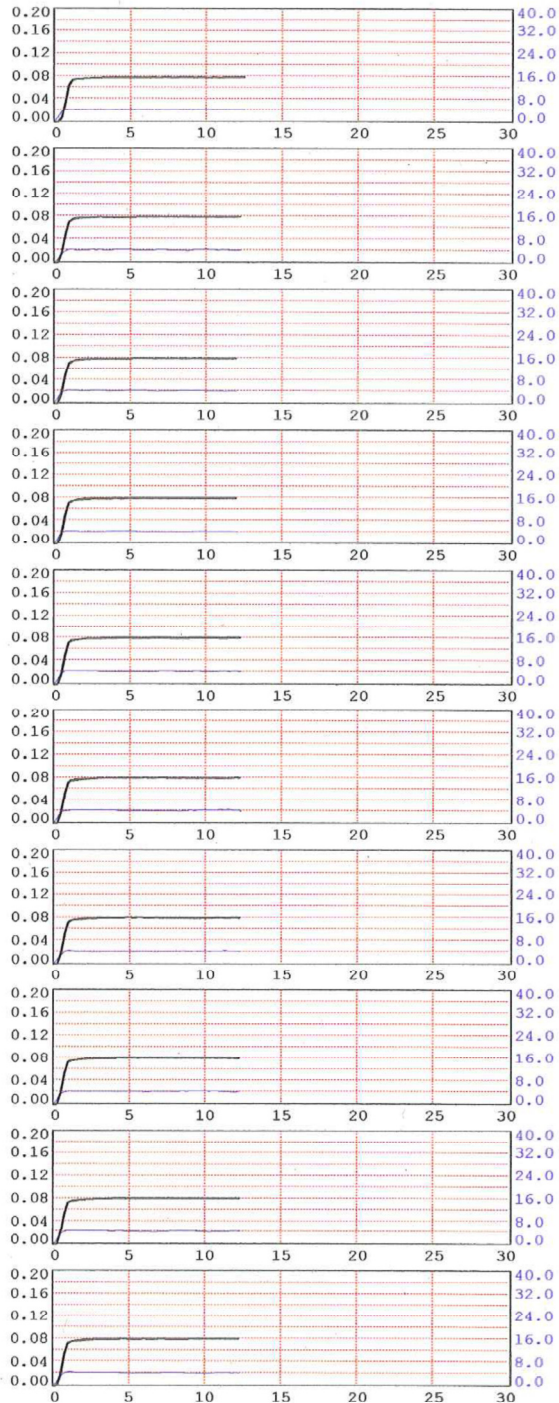
SUPERVISOR NAME:  
ROBERT DRISCOLL

SOLUTION LOT #: 12-75-08A1  
SOLUTION CONCENTRATION: 0.079

BLANK TEST	0.000	09:37
CALIBRATION CHECK	PASSED	09:37
SIMULATOR VAPOR 34.0°C	0.079	09:37
SIMULATOR VAPOR 34.0°C	0.080	09:38
SIMULATOR VAPOR 33.9°C INTERFERENCE		09:39
SIMULATOR VAPOR 33.9°C	0.080	09:40
SIMULATOR VAPOR 33.9°C	0.081	09:42
SIMULATOR VAPOR 34.0°C	0.081	09:43
SIMULATOR VAPOR 34.0°C	0.081	09:44
SIMULATOR VAPOR 34.0°C INTERFERENCE		09:45
SIMULATOR VAPOR 33.9°C	0.081	09:46
SIMULATOR VAPOR 33.9°C	0.081	09:47
BLANK TEST	0.000	09:48

Bad Lot of interference solution,  
replace with new Lot.

RCD 2/4/13



DMT Serial Number #100161

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ACCURACY & PRECISION REPORT

STATE OF VERMONT

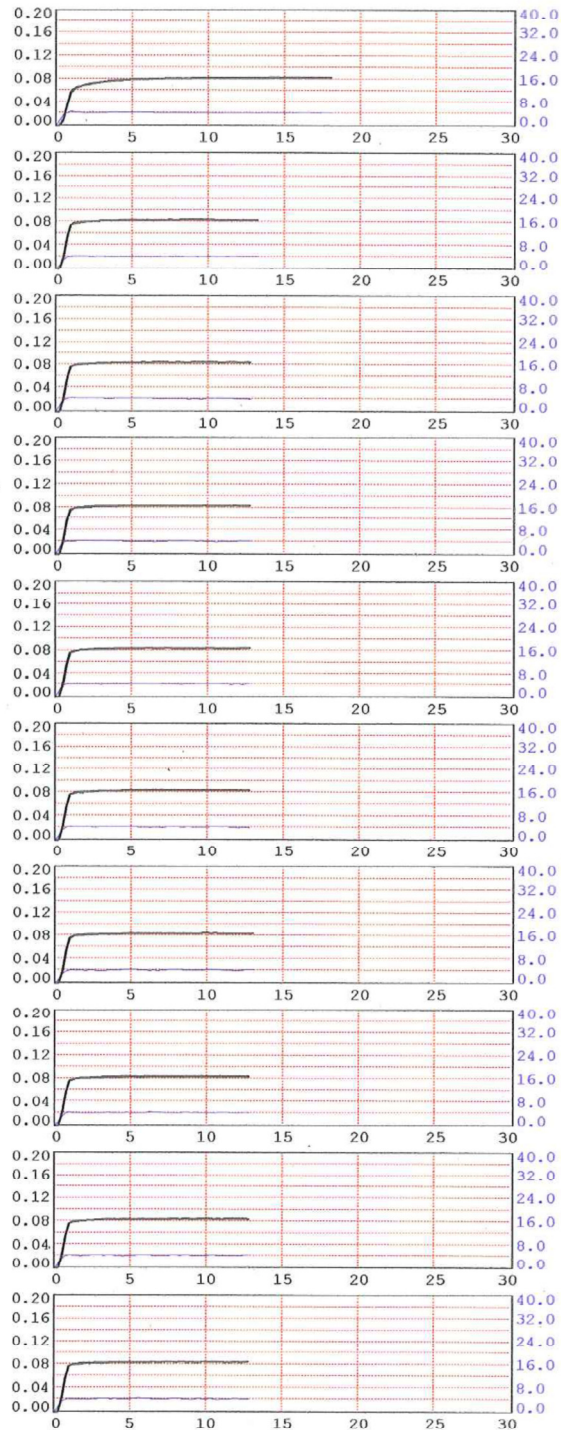
DataMeter DMT: 100161  
Location: Brattleboro VSP

Date: 02/04/2013  
Time: 10:24:11

SUPERVISOR NAME:  
ROBERT DRISCOLL

SOLUTION LOT #: 12-85-08A1  
SOLUTION CONCENTRATION: 0.081

BLANK TEST	0.000	10:25
CALIBRATION CHECK	PASSED	10:25
Xq = 0.086 (0.41%)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:25	
X[1] = 0.0841 (-0.0086) (0.0013)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:26	
X[1] = 0.0846 (-0.0084) (0.0003)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:27	
X[1] = 0.0857 (-0.0081) (0.0006)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:28	
X[1] = 0.0854 (-0.0088) (0.0003)		
SIMULATOR VAPOR 34.0°CINTERFERENCE	10:29	
X[1] = 0.0855 (-0.0086) (0.0001)		
SIMULATOR VAPOR 34.0°CINTERFERENCE	10:30	
X[1] = 0.0850 (-0.0090) (-0.0002)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:31	
X[1] = 0.0853 (-0.0085) (0.0002)		
SIMULATOR VAPOR 34.0°CINTERFERENCE	10:33	
X[1] = 0.0851 (-0.0086) (0.0002)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:34	
X[1] = 0.0856 (-0.0088) (0.0000)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:35	
X[1] = 0.0854 (-0.0087) (-0.0002)		
BLANK TEST	0.000	10:36



DMT Serial Number #100161

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02/04/2013 11:15 AM

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## DIAGNOSTIC RESULT

DataMaster DMT:100161  
Location: Brattleboro VSP  
Calibration Date: 08/22/2011  
Certification Date:08/22/2011  
Installation Date: 09/02/2011  
Test Date: 02/04/2013  
Test Time: 10:38:04



VERSIONS  
DMT: 1.01  
PIC: 2.05  
Modem: 2.4  
Questions: 2.1

### TEMPERATURES

Sample Chamber = 48.7°C  
Breath Tube = 45.6°C  
Digital Sim = 33.8°C

### SETTINGS

Lamp Voltage = 1.79 V  
Cooler Voltage = 1.77 V  
Bias Voltage = 80 V  
Chopper Freq = 534 Hz

### PUMP INFO

Flow Rate = 0.511 L/min

SECTION 1  
PUMP ON  
PUMP (V) = 0.000 -0.000  
PUMP (V) = 0.000 -0.000

SECTION 2  
FILTER 1 = 0.000 0.000 = true  
Filter 2 = 0.000 0.000 = true  
Filter 3 = 0.000 0.000 = true

SECTION 3  
T1 = 0.000 0.000



# ACCURACY & PRECISION REPORT

## STATE OF VERMONT

DataMeter DMT: 104709

Location: vdhl

Date: 11/29/2012

Time: 08:32:47

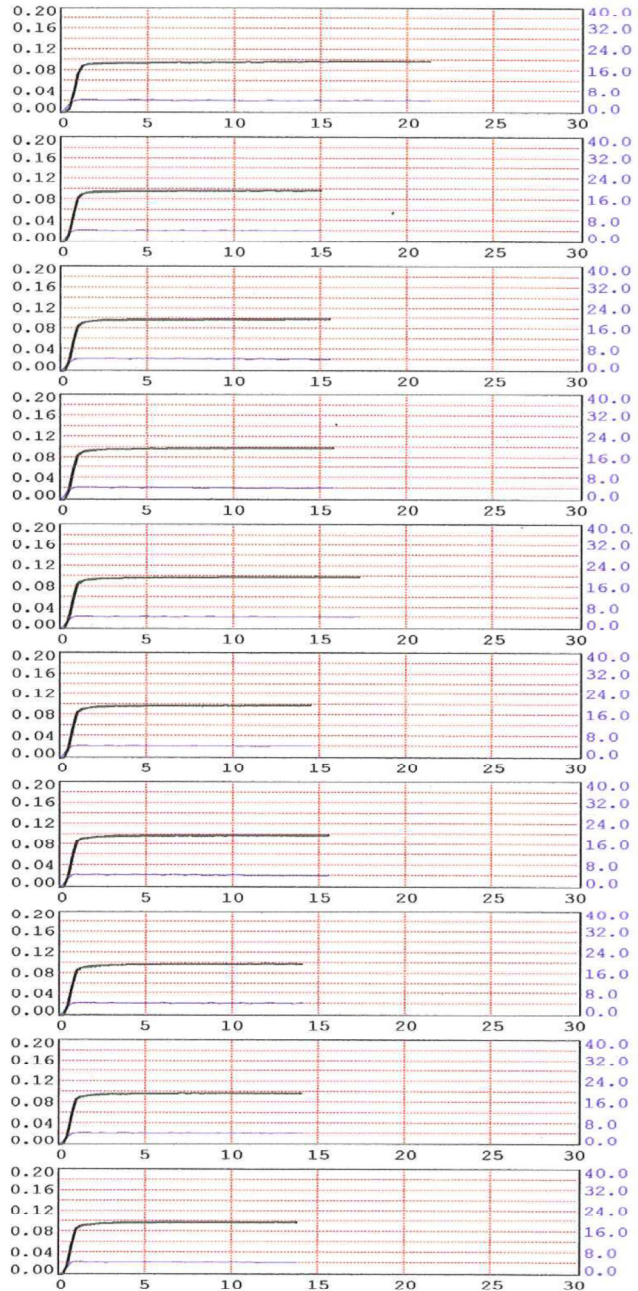
SUPERVISOR NAME:

ROBERT DRISCOLL

SOLUTION LOT #: 12-84-100

SOLUTION CONCENTRATION: 0.101

BLANK TEST	0.000	08:33
CALIBRATION CHECK	PASSED	08:33
X <sub>q</sub> = 0.078 (0.11%)		
SIMULATOR VAPOR 33.9°C	0.099	08:34
X[1] = 0.0998 (0.0009) (0.0019)		
SIMULATOR VAPOR 33.9°C	0.099	08:35
X[1] = 0.0993 (0.0001) (0.0012)		
SIMULATOR VAPOR 33.9°C	0.100	08:36
X[1] = 0.1002 (0.0002) (0.0011)		
SIMULATOR VAPOR 33.9°C INTERFERENCE		08:37
X[1] = 0.1003 (-0.0001) (-0.0391)		
SIMULATOR VAPOR 33.9°C	0.100	08:38
X[1] = 0.1009 (0.0004) (0.0011)		
SIMULATOR VAPOR 33.9°C	0.100	08:39
X[1] = 0.1005 (0.0001) (0.0009)		
SIMULATOR VAPOR 33.9°C	0.100	08:40
X[1] = 0.1005 (0.0003) (0.0007)		
SIMULATOR VAPOR 33.9°C	0.100	08:42
X[1] = 0.1001 (-0.0006) (0.0004)		
SIMULATOR VAPOR 33.9°C	0.099	08:43
X[1] = 0.0997 (-0.0009) (0.0013)		
SIMULATOR VAPOR 34.0°C	0.099	08:44
X[1] = 0.0995 (-0.0006) (0.0007)		
BLANK TEST	0.000	08:45





## ACCURACY &amp; PRECISION REPORT

## STATE OF VERMONT

DataMater DMT: 104709

Location: vdhl

Date: 11/29/2012

Time: 10:19:16

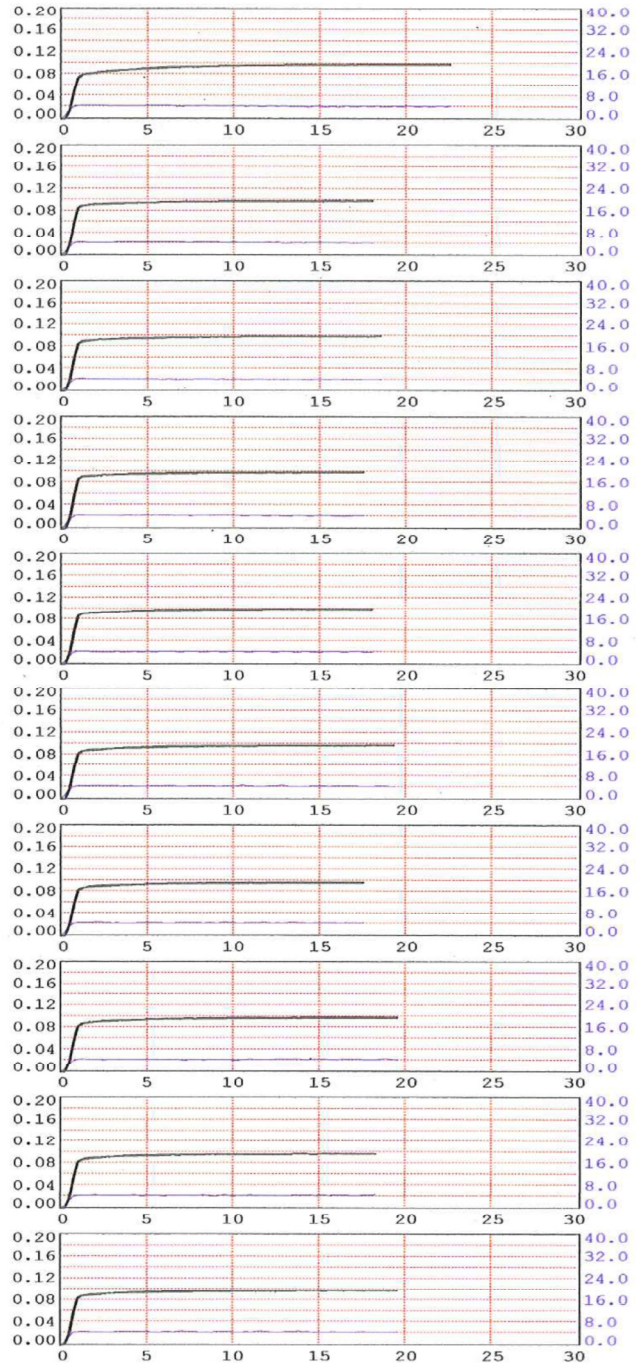
SUPERVISOR NAME:

ROBERT DRISCOLL

SOLUTION LOT #: 12-84-100

SOLUTION CONCENTRATION: 0.101

BLANK TEST	0.000	10:20
CALIBRATION CHECK	PASSED	10:20
Xq = 0.077 (1.12%)		
SIMULATOR VAPOR 33.9°C	0.100	10:20
X[1] = 0.1000 (0.0011) (0.0004)		
SIMULATOR VAPOR 33.9°C	0.100	10:21
X[1] = 0.1001 (-0.0002) (-0.0008)		
SIMULATOR VAPOR 34.0°C	0.100	10:23
X[1] = 0.1009 (0.0000) (-0.0009)		
SIMULATOR VAPOR 34.0°C	0.100	10:24
X[1] = 0.1006 (-0.0001) (-0.0006)		
SIMULATOR VAPOR 34.0°C	0.101	10:25
X[1] = 0.1013 (0.0006) (-0.0002)		
SIMULATOR VAPOR 33.9°C	0.099	10:26
X[1] = 0.0993 (-0.0008) (-0.0004)		
SIMULATOR VAPOR 33.9°C INTERFERENCE		10:27
X[1] = 0.0982 (-0.0003) (0.0436)		
SIMULATOR VAPOR 34.0°C	0.100	10:29
X[1] = 0.1000 (-0.0003) (-0.0008)		
SIMULATOR VAPOR 34.0°C	0.099	10:30
X[1] = 0.0993 (-0.0004) (-0.0008)		
SIMULATOR VAPOR 33.9°C	0.099	10:31
X[1] = 0.0994 (-0.0006) (0.0000)		
BLANK TEST	0.000	10:32



DMT Serial Number #104709

Page 1 of 1 TEST RUN IN TRAINING MODE

11/29/2012 10:34 AM



## DIAGNOSTIC RESULT

DataMaster DMT: 104709  
Location: vdhl  
Calibration Date: 11/15/2011  
Certification Date: 11/15/2011  
Installation Date: 11/21/2011  
Test Date: 12/17/2012  
Test Time: 13:19:01



VERSIONS  
DMT: 1.01  
PIC: 2.05  
Modem: 2.4  
Questions: 2.1

### TEMPERATURES

Sample Chamber = 49.5°C  
Breath Tube = 48.1°C  
Digital Sim = 33.9°C

SETTINGS  
Lamp Voltage = 1.75 V  
Cooler Voltage = 1.69 V  
Bias Voltage = 80 V  
Chopper Freq = 533 Hz

PUMP INFO  
Flow Rate = 5.780 L/M

DETECTOR INFO  
PUMP ON OFF  
MAX(V) -0.1856 -0.1821  
MIN(V) -0.1872 -0.1835

FILTER INFO  
Filter 1 -0.183 Zero = true  
Filter 2 0.068 Zero = true  
Filter 3 -0.140 Zero = true

CALIBRATION CHECK  
OK - 0.077 0.004

## CALIBRATION REPORT

DataMaster DMT: 104709  
Calibration Date: 12/18/2012  
Calibrated by: ROBERT DRISCOLL  
Lot: 12-71-100



Ca	=	0.100			
CAL	=	0.977476	0.800	<=	CAL < 1.200
b1	=	0.000	0.000	<=	b1 < 0.004
b2	=	0.005	0.002	<=	b2 < 0.010
b3	=	0.000	0.000	<=	b3 < 0.004
Xq	=	0.077	0.050	<=	Xq < 0.200
a21	=	1.164161	1.050	<=	a21 < 1.300
a31	=	0.437114	0.300	<=	a31 < 0.800

Performed by

A handwritten signature in black ink, appearing to read "Robert Driscoll", is written over a horizontal line.

Date

12/18/2012





## ACCURACY &amp; PRECISION REPORT

## STATE OF VERMONT

DataMater DMT: 104709

Date: 12/18/2012

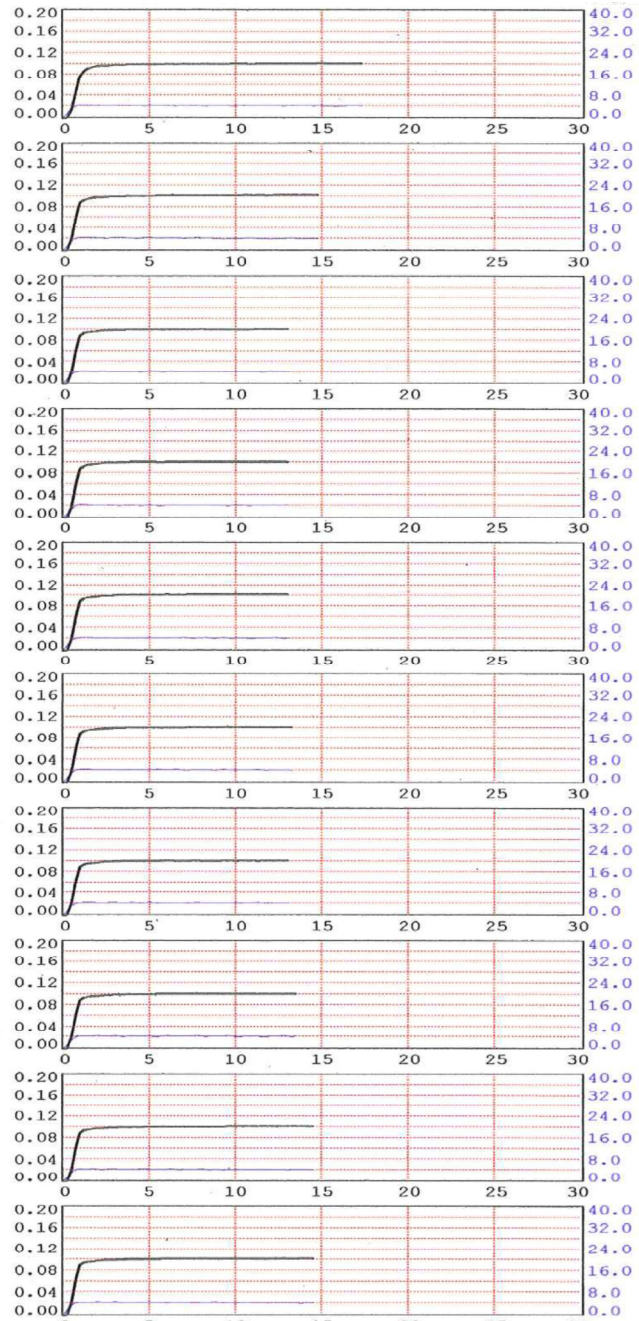
Time: 09:03:34

SUPERVISOR NAME:  
RCD CAL CHECK

SOLUTION LOT #: 12-61-100

SOLUTION CONCENTRATION: 0.101

BLANK TEST	0.000	09:04
CALIBRATION CHECK	PASSED	09:04
Xq = 0.077 (0.45%)		
SIMULATOR VAPOR 33.9°C	0.102	09:04
X[1] = 0.1028 (-0.0002) (0.0019)		
SIMULATOR VAPOR 33.9°C	0.103	09:06
X[1] = 0.1032 (-0.0003) (-0.0003)		
SIMULATOR VAPOR 33.9°C INTERFERENCE		09:07
X[1] = 0.1030 (0.0000) (-0.0082)		
SIMULATOR VAPOR 33.9°C	0.102	09:08
X[1] = 0.1026 (-0.0005) (0.0002)		
SIMULATOR VAPOR 34.0°C	0.102	09:09
X[1] = 0.1029 (0.0001) (0.0006)		
SIMULATOR VAPOR 34.0°C	0.102	09:10
X[1] = 0.1029 (-0.0001) (0.0004)		
SIMULATOR VAPOR 33.9°C	0.103	09:11
X[1] = 0.1031 (-0.0001) (0.0006)		
SIMULATOR VAPOR 33.9°C	0.102	09:12
X[1] = 0.1026 (-0.0013) (0.0002)		
SIMULATOR VAPOR 33.9°C	0.103	09:13
X[1] = 0.1030 (-0.0008) (0.0004)		
SIMULATOR VAPOR 34.0°C	0.103	09:14
X[1] = 0.1035 (-0.0002) (0.0003)		
BLANK TEST	0.000	09:15





## ACCURACY &amp; PRECISION REPORT

## STATE OF VERMONT

DataMater DMT: 104709

Date: 12/19/2012

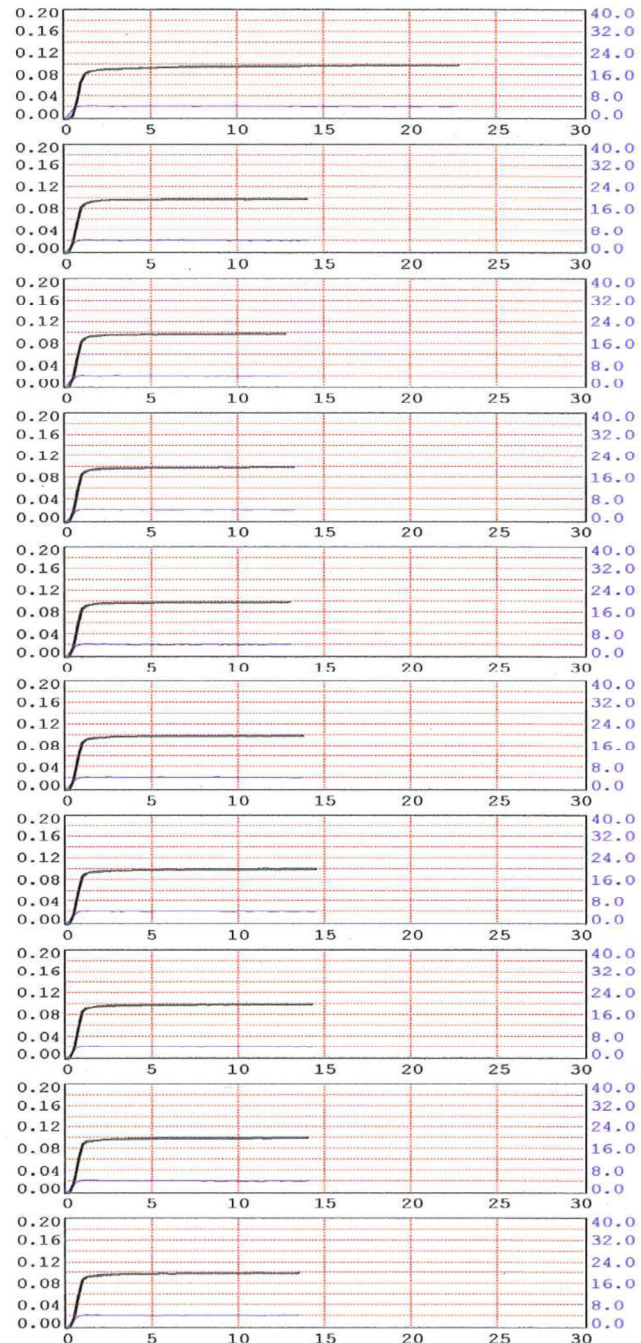
Time: 09:29:09

SUPERVISOR NAME:  
ROBERT DRISCOLL

SOLUTION LOT #: 12-84-100

SOLUTION CONCENTRATION: 0.101

BLANK TEST	0.000	09:30
CALIBRATION CHECK	PASSED	09:30
Xq = 0.077 (0.11%)		
SIMULATOR VAPOR 33.9°C	0.100	09:30
X[1] = 0.1003 (-0.0003)	(0.0021)	
SIMULATOR VAPOR 34.0°C	0.100	09:31
X[1] = 0.1001 (-0.0004)	(0.0027)	
SIMULATOR VAPOR 33.8°C	0.099	09:32
X[1] = 0.0998 (-0.0008)	(0.0022)	
SIMULATOR VAPOR 33.9°C	0.100	09:33
X[1] = 0.1004 (-0.0002)	(0.0026)	
SIMULATOR VAPOR 33.9°C	0.100	09:34
X[1] = 0.1006 (-0.0004)	(0.0027)	
SIMULATOR VAPOR 33.9°C	0.101	09:36
X[1] = 0.1010 (-0.0001)	(0.0026)	
SIMULATOR VAPOR 33.9°C	0.101	09:37
X[1] = 0.1017 (-0.0001)	(0.0024)	
SIMULATOR VAPOR 33.9°C INTERFERENCE	0.101	09:38
X[1] = 0.1012 (-0.0007)	(-0.0362)	
SIMULATOR VAPOR 34.0°C	0.101	09:39
X[1] = 0.1014 (0.0000)	(0.0025)	
SIMULATOR VAPOR 33.9°C	0.100	09:40
X[1] = 0.1000 (-0.0006)	(0.0026)	
BLANK TEST	0.000	09:41







ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMeter DMT: 104709

Date: 12/19/2012

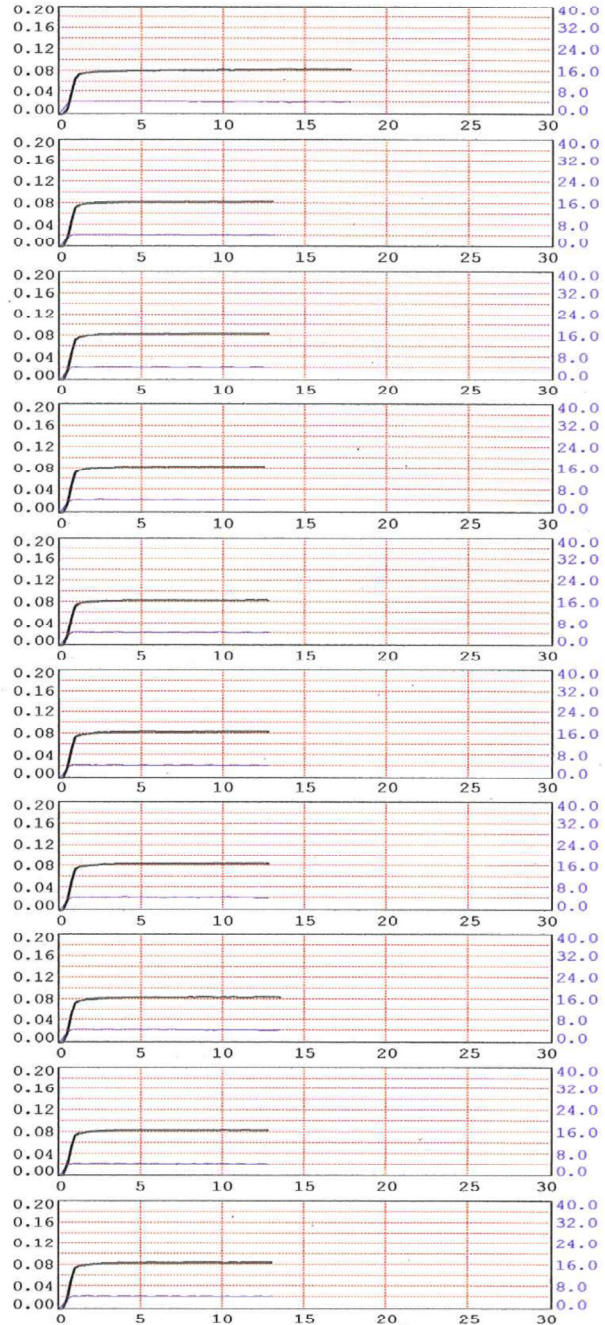
Time: 09:01:51

SUPERVISOR NAME:  
ROBERT DRISCOLL

SOLUTION LOT #: 12-81-081A1  
SOLUTION CONCENTRATION: 0.080

BLANK TEST	0.000	09:02
CALIBRATION CHECK	PASSED	09:02
Xq = 0.077 (0.11%)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:03	
X[1] = 0.0851 (-0.0053) (0.0009)		
SIMULATOR VAPOR 34.0°CINTERFERENCE	09:04	
X[1] = 0.0849 (-0.0054) (0.0149)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:05	
X[1] = 0.0850 (-0.0052) (0.0371)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:06	
X[1] = 0.0851 (-0.0057) (0.0068)		
SIMULATOR VAPOR 33.8°CINTERFERENCE	09:07	
X[1] = 0.0853 (-0.0055) (0.0001)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:08	
X[1] = 0.0848 (-0.0064) (-0.0004)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:09	
X[1] = 0.0858 (-0.0056) (0.0004)		
SIMULATOR VAPOR 34.0°CINTERFERENCE	09:10	
X[1] = 0.0858 (-0.0058) (-0.0062)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:11	
X[1] = 0.0857 (-0.0060) (0.0007)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	09:12	
X[1] = 0.0855 (-0.0059) (0.0000)		
BLANK TEST	0.000	09:13

0.079 EtOH  
0.01% Acetone  
12/20/12 JRS



DMT Serial Number #104709

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12/19/2012 9:19 AM



ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMater DMT: 104709

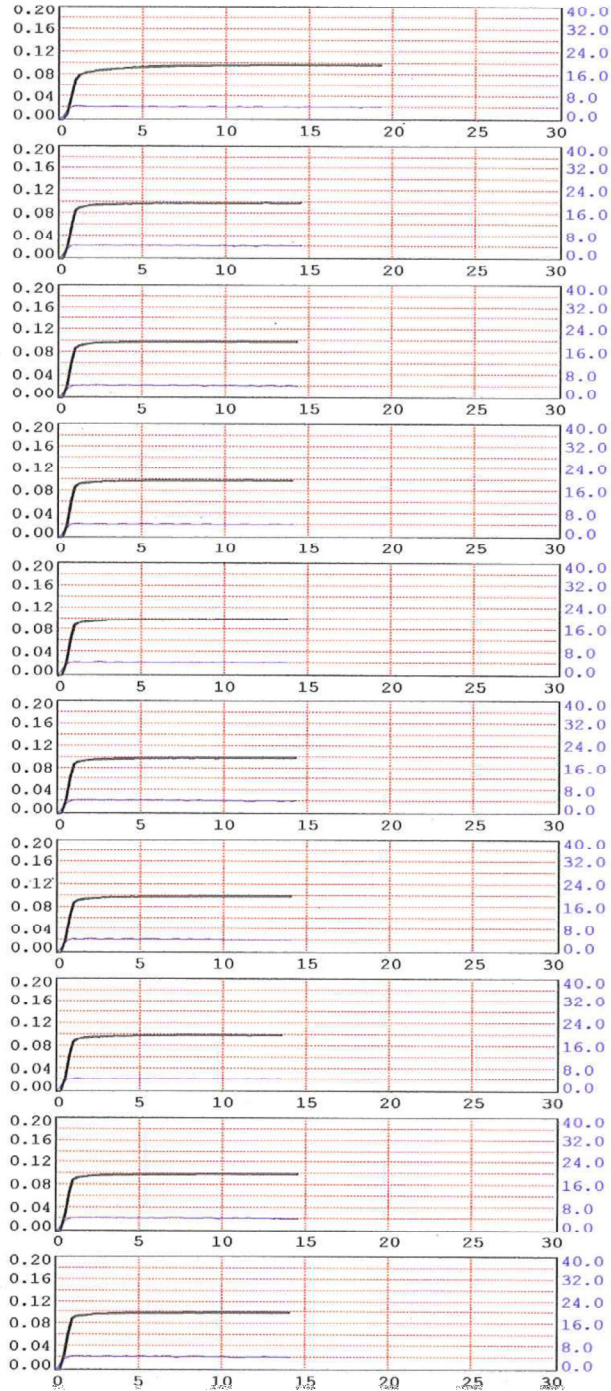
Date: 12/19/2012  
Time: 10:56:48

SUPERVISOR NAME:  
ROBERT DRISCOLL

SOLUTION LOT #: 12-63-080M  
SOLUTION CONCENTRATION: 0.081

BLANK TEST	0.000	10:57
CALIBRATION CHECK	PASSED	10:57
Xq = 0.078 (0.56%)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:58	
X[1] = 0.0993 (-0.0057) (-0.0034)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	10:59	
X[1] = 0.1001 (-0.0062) (-0.0049)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	11:00	
X[1] = 0.1002 (-0.0061) (-0.0146)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	11:01	
X[1] = 0.1002 (-0.0060) (-0.0123)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	11:02	
X[1] = 0.1005 (-0.0060) (-0.0048)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	11:03	
X[1] = 0.1007 (-0.0056) (-0.0117)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	11:04	
X[1] = 0.1005 (-0.0063) (-0.0114)		
SIMULATOR VAPOR 33.8°CINTERFERENCE	11:05	
X[1] = 0.1003 (-0.0067) (-0.0054)		
SIMULATOR VAPOR 33.9°CINTERFERENCE	11:06	
X[1] = 0.1007 (-0.0065) (-0.0059)		
SIMULATOR VAPOR 34.0°CINTERFERENCE	11:08	
X[1] = 0.1006 (-0.0065) (-0.0054)		
BLANK TEST	0.000	11:08

0.081g/100L EtOH  
0.04% MeOH  
12/20/12 drg



DMT Serial Number: 104709

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12/19/2012 11:08 AM





# ACCURACY & PRECISION REPORT

STATE OF VERMONT

DataMater DMT: 104709

Date: 12/19/2012

Time: 11:12:13

SUPERVISOR NAME:  
ROBERT DRISCOLL

SOLUTION LOT #: 12-63-0801  
SOLUTION CONCENTRATION: 0.081

BLANK TEST	0.000	11:13
CALIBRATION CHECK	PASSED	11:13
Xq = 0.077 (0.34%)		
SIMULATOR VAPOR 33.8°CINTERFERENCE		11:13
X[1] = 0.1109 (-0.0304) (-0.0029)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:14
X[1] = 0.1118 (-0.0311) (0.0020)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:15
X[1] = 0.1112 (-0.0318) (0.0020)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:16
X[1] = 0.1112 (-0.0314) (0.0105)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:17
X[1] = 0.1114 (-0.0308) (0.0015)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:19
X[1] = 0.1112 (-0.0313) (0.0017)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:20
X[1] = 0.1114 (-0.0313) (0.0021)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:21
X[1] = 0.1113 (-0.0316) (0.0017)		
SIMULATOR VAPOR 33.9°CINTERFERENCE		11:22
X[1] = 0.1111 (-0.0315) (0.0019)		
SIMULATOR VAPOR 33.8°CINTERFERENCE		11:23
X[1] = 0.1109 (-0.0319) (0.0023)		
BLANK TEST	0.000	11:24

0.081g/100L EtOH  
0.04% IPA  
12/20/12 AJS

